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THE CANADIAN SEA ICE GUIDE - AN OVERVIEW

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ABSTRACT

This paper summarizes a project presently being undertaken by C-CORE which is scheduled to be completed by March, 1985. The intent of the project is to abstract. compile and synthesize available ice data from Canadian waters which is relevant to loads on offshore structures and to the design and operations of vessels. The end product will be a hardcopy synthesis of the available data and a computerized database.

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INTRODUCTION

The intent of the project is to abstract, compile and synthesize available ice environment information which is relevant to loads on offshore structures and to the design and operation of vessels.

The compiled data is intended to provide an information base for the derivation of offshore design standards. This will be of primary interest to the expert user. The C.S.I.G. will also include a hardcopy synthesis which will present an overview of the dynamic characteristics (strength, motion, geometry) of the ice environment and will lead to the definition of geographic zones on the basis of similarity. The synthesis is intended as a quantitative integration of the data base; it would provide the non-expert or casual user with a reliable overview of ice conditions in terms which are most relevant to marine engineering and research.

THE CANADIAN SEA ICE GUIDE STRUCTURE

Scope

The purpose of this project is to produce a reference data base and source document which will describe and document the composition; physical characteristics, and the behaviour of marine ice (including icebergs). The data compiled is restricted to field studies on marine ice (including lab analysis of field samples). Experimental laboratory results and fresh water studies are omitted. The area of interest is confined to Canadian marine waters.

Data Sources

The project will identify and assimilate from the Canadian Government, the oil and gas industry, consultants, and academic institutions non-proprietary information on ice properties and conditions (distribution, velocity, morphology, etc.). Proprietary data will be referenced but not included. Environmental factors which may act on or through the ice (ocean currents, winds, waves, etc.) will be included only when the data is strictly relevant and was collected concurrently with the data. The AES historical ice charts will be used as the primary source of ice distribution data and will be presented in a summarized format. It is not the intention of the C.S.I.G. to duplicate other data bases.

Users

The sea ice guide is intended to satisfy the needs of the following categories of users in order of priority.

A. The data base will be compiled for use in the engineering and design of:

1. Structures: gravity and floating
2. Vessels: icebreakers, bulk carriers etc.
3. Platforms and roads: drilling pads, ice roads.

The data base will also, as far as possible, be pertinent to the engineering implementation and operation of:

4. Structures
5. Vessels
6. Platforms.

B. The general synthesis and geographic zonation is intended to provide comparative ice environment information for:

1. Engineering feasibility studies
2. Management decisions
3. Research management
4. Research
5. Education.

Existing Data Catalogues

The Institute of Ocean Sciences, Sydney. B.C. is completing its series of "Arctic Data Compilation and Appraisal" Catalogues. These evaluate and document physical. chemical and biological oceanographic data sets. The Canadian Sea Ice Guide is intending to compliment the above data catalogues and therefore the same geographical areas of studies have been adopted. The Institute of Ocean Sciences arbitrarily divided the Arctic into 7 geographical areas to include major oceanographic regions. The Canadian Sea Ice Guide has extended the areas to include the Labrador Sea, Grand Banks and Gulf of St. Lawrence. Refer to Figure 1. Geographic Areas of Study.

Conceptual Structure of Data Base

The conceptual structure of the data base is outlined in Figure 2.

The task of abstracting data is not always a straight forward procedure. Tabulated results are extracted directly and put on file. Equally relevant information is contained in graphed data, text and photographed results (such as aerial photos of ice surveys); however. the process of extracting this data is based on subjective decisions and the data may be misinterpreted. Where possible a summary of the author's results and conclusions are abstracted; otherwise the user is referred back to the original report. These raw data files are stored on a relational database management system (INGRES).

As the data from each report is abstracted it is assigned a unique identification number of the form yynnna. Where yy represents last 2 digits of year in which the report was published, nnn represents order of identification for that particular data set for that year, and a represents the geographical area in which the data was collected.

For quick reference and easy identification, keywords are used to summarize the ice types and subject matter of each report. This information, along with the unique ID number, is stored in the "Yellow Pages".

A bibliography of all the relevant data sets is listed by the ID number and includes the source information for the user who wishes to consult the original document.

Statistical synthesis will be generated for each data set and will include the number of records, the maximum value, the minimum value and the mean.

Hierarchy for Data Abstraction

It was mentioned above that as data is abstracted, the ice type. subject matter, etc. is summarized by keywords. Figure 3 is the hierarchy set up by the C.S.I.G. personnel for making this summary. The geographical areas listed are numbered from 0 to 9. They are incorporated into the unique ID number assigned to each data set. The specific ice type is given a keyword along with the various classes of ice parameters, thus enabling the user to sort according to specific ice characteristics.

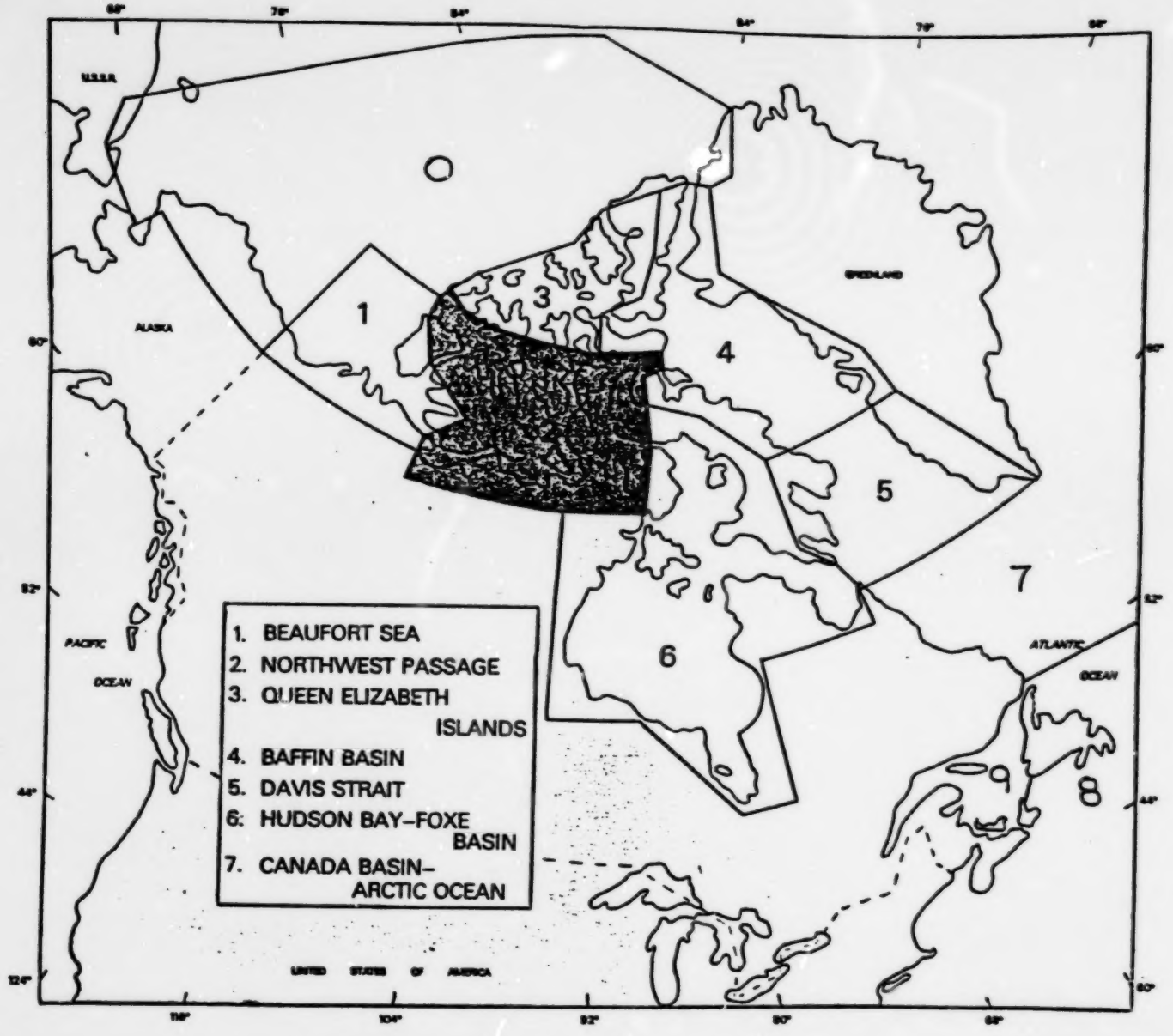

Figure 1 Geographical Areas of Study

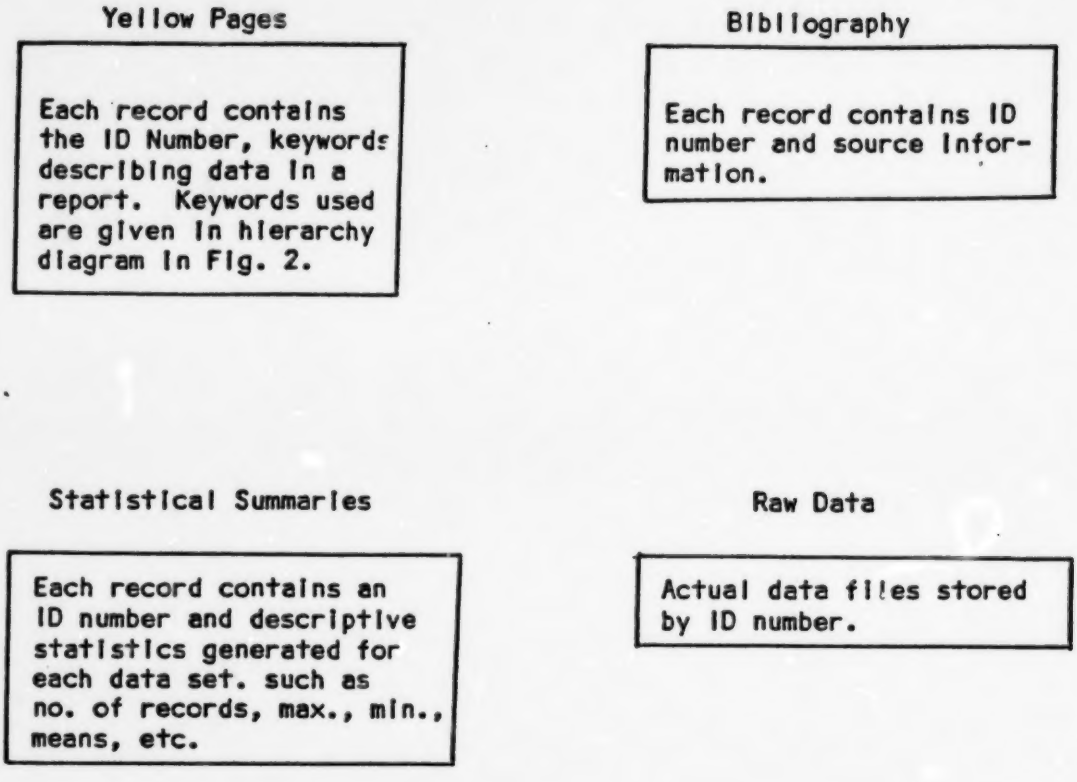

Figure 2 Conceptual Structure of Data Base

The four boxes represent the main sections of the data base. Each report containing data is assigned a unique ID number which is carried through when appropriate data for each box is abstracted.

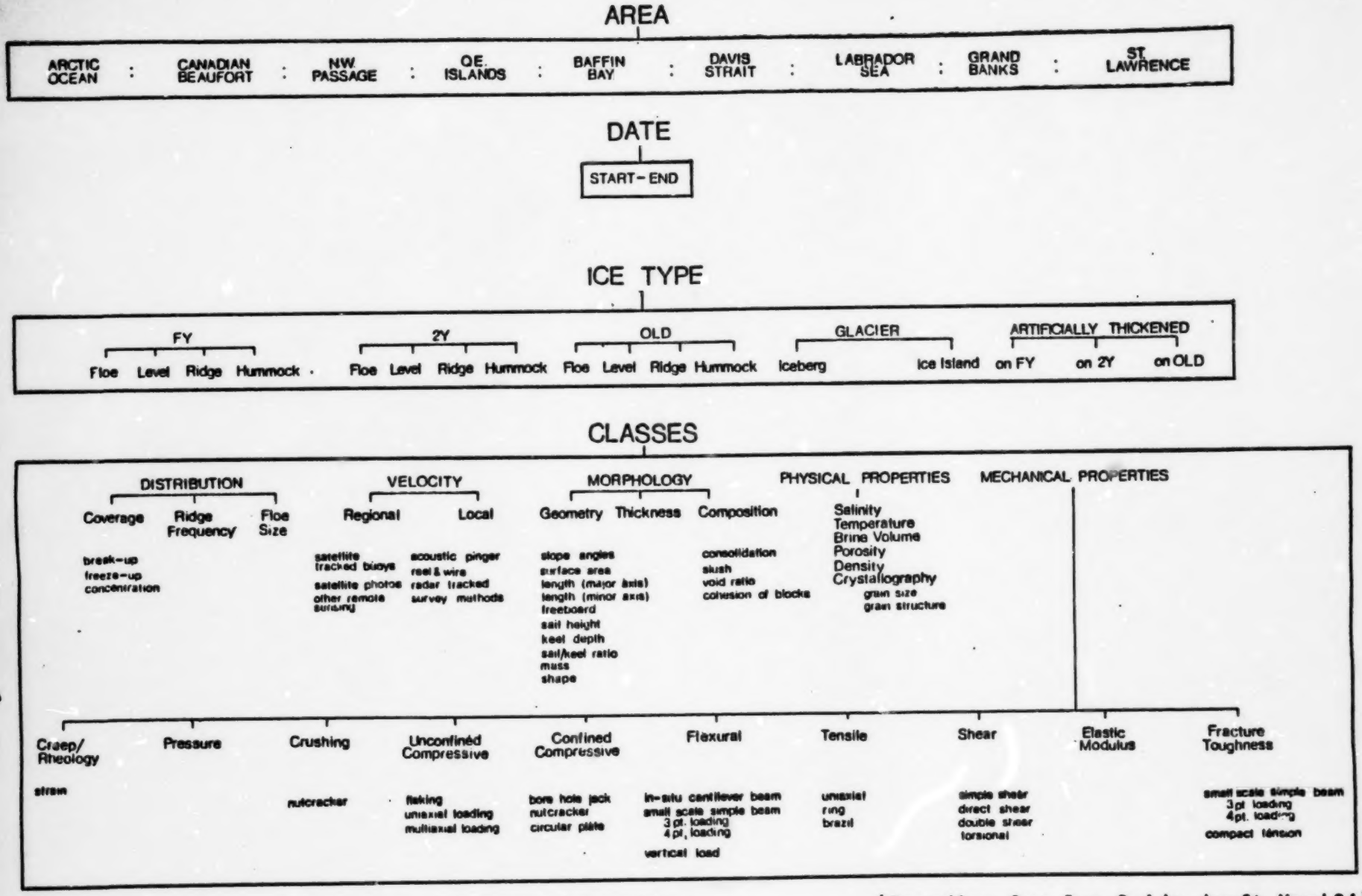

Figure 3 Heirarchy of Data Abstraction (Canadian Sea Ice Guide draft Mar'84)

Quality of Data Sets

The sea ice guide must contain some means by which the user can determine how useful a particular data set is for a specific purpose. There are few standardized methodologies, however, which the researcher can follow closely to evaluate relevant ice parameters. This presents problems when trying to compare different data sets. Theoretically, different techniques may measure the same property but actually may not.

Personnel involved in the Arctic Data Compilation and Appraisal Catalogues were also confronted with this problem when attempting to synthesize and evaluate the physical and chemical oceanography data. A 5-level rating system was designed which enables the user to quickly identify the usefulness of the data. The rating scale is broken down as follows:

Rating Score	Data Quality
0 :	- Data found to be wrong (deficiency in technique or absence of important information)
1 :	- Data suspect because of ill defined doubts
2 :	- Insufficientinformation to assess data
3 :	- Data are internally consistent - patterns or trends within data probably real but comparison with other data sets may pose problems
4 :	- Data are internally consistent and exhibit sufficient standardization to allow comparison with other data rated 4.

The C.S.I.G. is presently evaluating the possibility of adapting this rating scale for the marine ice data.

PARTICIPANTS

The primary project funding is derived from a Max Bell Foundation grant to C-CORE with matching support from COGLA (Canada Oil and Gas Lands Administration). A technical committee, consisting of representatives from COGLA, Atmospheric Environment Service, National Research Council, Canadian Petroleum Association and Arctic Petroleum Operators Association, has been set up to give advice on data treatment and final presentation. The Canadian Sea Ice Guide will be maintained and updated following its completion in 1985. It will be operating on a computer facility designated by the Federal Government.

References

Bowman, C.M. (1982). Workshop on Data Quality Indicators: Summary Report and Recommendations. February 10-12, 1982, Gaithersburg, Maryland, 15 pages.

Thomas, D.J., MacDonald, R.W., Francis, A.G., Wood, V., and Cornford, A.B.. (1983). Arctic Data Compilation and Appraisal, Volume 4. Canadian Data Report of Hydrography and Ocean Sciences, No. 5. 200p.

POOR

QUALITY

ORIGINAL